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ABSTRACT

This discussion of the need for and efforts to develop technological education in K-12 schools argues that the United States must achieve an acceptable level of technological literacy among its children if it is to maintain its competitive edge. Thus, technology is being suggested as an additional domain of knowledge (along with the sciences, humanities, and formal knowledge) in new models of curriculum theory. Technological education programs are now being developed out of, and replacing, long standing programs in industrial arts, with the emphasis in the elementary school on developing children's awareness of the presence of technology in their lives; in the middle school, on the exploration of different kinds of technology; and in the high school, on the choice of technical or vocational education as preparation for the work world. In addition, colleges and universities which prepare teachers for the practical arts must now revise their programs to introduce teacher candidates to technology education. (2 references) (EW)

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# TECHNOLOGY EDUCATION: IN PURSUIT OF TECHNOLOGICAL LITERACY

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Presentation Objectives:

1. To provide the background and rationale for the national movement to establish curricula in technology education.

2. To describe the concepts and learning activities for K-12 instruction in technology education.

3. To define a role for teacher education programs in preparing teachers of technology education.

Abstract:

A nation not able to utilize its human and technological resources to their fullest cannot hold a competitive edge in this rapidly changing world. The United States must face the prospect that if it does not achieve an acceptable level of technological literacy among its children, they may never experience the "good life" of earlier generations.

Technology education has in just three years become accepted by prominent educators as a necessary component of the education of all children and youth, and as a way to achieve greater technological literacy in our society. A number of states in the U.S. are now giving major support to the development of instructional programs in technology education in an effort to provide all students the knowledge and skills needed to live in this increasingly complex technological world.

Technology Education in K-12 schools provides problem solving experiences and learning activities in such technologies as communication, transportation, construction and manufacturing. Programs which have been operating for nearly 100 years under the label "Industrial Arts Education" are being replaced in school districts across the nation with new instructional models in Technology Education.

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**National/Societal Issues**

The primary thesis in this paper is that if the new generations of children in our schools do not find the opportunity to develop a higher degree of technological literacy than those of the past, our nation in the near future will most certainly be "at risk." The technological and economic advantages other industrialized nations of the world are aggressively pursuing will leave the United States in a serious condition of economic and manpower dependency by the turn of this century.



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Events in recent years clearly indicate that our schools have not given attention to developing an acceptable level of understanding of technological activity in the world today. The inability of industries in the U.S. to respond effectively to changing market demands for quality and quantity in goods is one indicator of that failure. The manpower and the technology presently available in this nation have not been meeting the challenge of a highly competitive world market. Both have been much too slow in their development because schools at all levels of education persist in offering curricula which ignore the realities of a rapidly changing world.

The advanced scientific and engineering demands of modern technology have not been understood by the leaders of our educational institutions. Children and youth in K-12 school programs have not had access to curricula which would provide them the broad base of experiences in applying mathematic and scientific principles in problem situations representative of our highly technological environment. Far too few of these young people are accepting the challenge for studies in technology which would provide this nation with the qualified tradesmen, technicians, technologists, and engineers to keep it in a competitive economic position.

At a time when there is a great need for workers at all levels of employment in technological occupations, we find literally tens of thousands of young people unemployed, unemployable and developing a total dependency upon the state for their well-being. They lack the most fundamental knowledge of technology to guide them in the pursuit of education for self-improvement and full employment. In far too many cases they lack the basic communication and computational skills which would help them make that first step toward those goals. Many as children or youths lost the motivation to continue their education because of their experiences with school curricula that held virtually no connection with the real world and its rapidly advancing and highly technological living conditions.

**Being Technologically Literate**

We depend upon the technology that surrounds us for our well-being. Technology exists and has evolved because of the strong human desire to find better ways of doing things--to extend our ability to achieve. We would not choose to return to a simpler or less technologically dependent life-style because we could not survive for long with it. Since this is the real condition of our present being, then several critical questions must be asked. What do we know about that technology and how to control it? Is it controlling us and dictating the way we live and what we do day-to-day? Will future generations of our children be able to take advantage of technology for their own benefit?

A number of prominent studies conducted in recent years on the condition of education in this nation speak of the need to develop in young people skills most suited to the technological world they will encounter. Those skills include an ability to (1) adapt to a continuously changing employment market created by rapidly advancing technologies in the workplace, (2) communicate effectively using the symbols and language of contemporary life, (3) solve problems using modern tools of science and technology, and, (4) learn how to learn as a way of acquiring new skills and knowledge to meet the demands of changing life conditions.

Being technologically literate means being able to deal effectively with the conditions of life in a technological world. As mankind has grown increasingly dependent upon technology for his existence, the need for his being technologically literate has also grown proportionately. In today's world, being technologically literate is critical to the very continuation of life.

**New Directions in the Study of Technology**

For many years we have relied upon a select group of programs to provide experiences in technology for a very limited population of students. Traditional vocational education has been used for the benefit of upper level senior high school students who are inclined to seek training for job entry upon graduation. The unfortunate thing is far too few young people have taken advantage of those programs. Even though vocational education has contributed much to the education of some youth, its programs tend to be quite limited in their focus and do not capture the interest of those young people until late in their schooling experience.

Programs in industrial arts education have been in operation since the late 1800's in middle and senior high schools, and in a very few instances been integrated with elementary school instruction. Traditional industrial arts has typically included studies and acitivities in woodworking, metalworking and drafting, and even some graphic arts, mechanics, and electricity/electronics. While its broader purpose has always been that of contributing to the general education of children and youth through technical experiences in these areas, too often its instruction has focused on the crafts and trades of industry with one-dimensional relationships.

Efforts to redirect industrial arts education which are being conducted by the International Technology Education Association, or ITEA, (formerly the American Industrial Arts Association), illustrate the potential for schools to create a climate in which technological literacy can be developed. The position of the ITEA is that all children and youth must have the opportunity to acquire technological literacy and should find the means to do so through apopropriate curricula in technology education.

With the encouragement and leadership of the ITEA, programs in technology education are being established throughout the nation. Traditional programs of industrial arts are being replaced with studies and laboratory experiences which deal with subsystems of human technological endeavor, including communication, transportation, manufacturing, and construction. Technology education is concerned not only with an understanding of the behavior of these subsystems, but with their social purpose, their relationship to human beings, and their relationship to the environment.

**The Basis for Technology Education**

A highly regarded model for curriculum theory used to guide the development of programs in technology education was prepared at the Jackson's Mill (West Virginia) Industrial Arts Curriculum Symposium (Snyder & Hales, 1981). That model asserts that conceptual activity--a key element of educational systems in our civilization--has been arrayed into domains of knowledge. Realizing that there are a number of designations for domains of knowledge, symposium participants identified four domains as the cognitive base for human adaptation in the natural environment. Those domains are (1) Sciences, (2) Humanities, (3) Technologies, and (4) Formal

Knowledge. The fourth domain, formal knowledge, is represented by language, linguistics, mathematics, and logic and provides form and structure to the other three domains (Snyder & Hales, 1981, pp. 3-6).

It was also concluded at the symposium that the analysis of human adaptive systems can provide an understanding of the evolution of human beings and their social and technical orders. Three of those systems--Ideological, Sociological, and Technological--are interrelated and exist within a man-made/natural environment. Further, it was established that the domains of knowledge interect with these major human adaptive systems. In other words, as people discover more knowledge, it helps them to adapt. As people develop improved ways to adapt, they contribute to the domains of knowledge.

**Instructional Programs in Technology Education**

Technology education must be an integral part of the general education of all children and youth. By its nature, it is interdisciplinary and appears at all grade levels through adult education. As the level of education moves upward, so does the degree of specialization in studies for technology education. It also draws heavily from the sciences for the underlying principles of technological activity which it illustrates in classrooms and laboratories.

Problem-solving and group activities are prominent conditions for learning in technology education. Flexible, adaptable, and dynamic are terms which describe the attitude of teachers and the structure of those programs. No two programs are identical, as the emphasis is upon the process for learning as much as it is upon the technical content that is included. The elementary child will deal with integrated units to develop an **awareness** of the presence of technology in their lives. Middle school youth will experience activities that permit them to **explore** many different kinds of technology, while the senior high student may chose to deal with a higher level of technical education or vocational education as **preparation** for the work world. Adult education can include any or all of these stages of experience.

**Teacher Preparation in Technology Education**

Universities and colleges which prepare teachers for the "practical arts" areas must now revise their programs to introduce teacher candidates to technology education. Those programs must display many of the same characteristics found in secondary level technology education. There is a greater need than ever in the past to prepare teachers with a breadth of integrated studies. It is also imperative that those studies include the mathematics and science areas.

Learning to work together to solve technical problems is something teacher education candidates must experience if they are to teach those processes. Technical content should be broadly inclusive and illustrate the interdisciplinary and interrelated nature of a variety of technologies. Finally, technology teacher education needs to contribute to the establishment of new programs in K-12 schools by assisting with the process of change and professional upgrading of current staffs in the schools.

**Conclusion**

The very survival of this nation rests upon our ability to respond to the need to develop technologically literate high school graduates. The loss of productive manpower and capacity, as well as

the inability of people to control through their own understanding the effects of technological activity, may lead us to become a very dependent nation--one which cannot effectively contribute to the improvement of conditions of living for its citizens. Technology education offers a viable educational process to alleviate this problem.

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